If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match.
The on-screen version of the Collider-Accelerator Department Procedure is the Official Version.
Hard copies of all signed, official, C-A Operating Procedures are kept on file in the C-A ESHQ Training Office, Bldg. 911A.

C-A OPERATIONS PROCEDURES MANUAL

ATTACHMENT

7.1.65.f Safety Issues Associated with the 2 O'Clock Yellow Valve Box

C-A OPM Procedures in which this Attachment is used.		
7.1.65		

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials
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Approved: _____***Signature on File***_____ _____
Collider-Accelerator Department Chairman Date

M. Sardzinski

BROOKHAVEN NATIONAL LABORATORY

SAFETY ISSUES ASSOCIATED WITH THE 2 O'CLOCK YELLOW VALVE BOX

Contributors: Bill Dejong, Len Masi, Anthony Nicoletti, Tom Tallerico, Andreas Warkentien, Mark Sardzinski, Dewey Lederle.

This document describes the safety issues associated with working on or inside the 2 o'clock yellow valve box. It is not meant to cover the details of every job. A job specific work permit reviewed by appropriate personnel is still required to complete any work inside the valve box.

MECHANICAL SAFETY ISSUES

Component Details

The 2 o'clock yellow valve box is part of the RHIC Cryogenic Distribution System. It is comprised of a vacuum tank that houses liquid pots, process piping, heat shield piping, temperature devices and liquid level probes. The following is detailed description of some of the major components, taken from ***Cryogenic System, vii System Components manual***.

Inlet Recooler (liquid pots): The Inlet Recooler is a heat exchanger assembly located in a valve box. By means of this heat exchanger helium gas which is about to enter the, magnet string at one end (Dipole D0) of a sextant is cooled to a temperature close to the temperature of the boiling liquid helium bath provided on one side of the heat exchanger.1 **Process Piping and valves:** The (present) conceptual design envisions that all the piping for a ring will be carried in a common jacket with a heat shield. Pipes will be provided to carry the helium for the following: Magnet coolant, with power leads, Supply header, Return header, Utility header and Heat Shield.

This connecting piping also contains all the isolation and diverting valves required to meet the RHIC operating scenarios. Groups of these valves have been gather into a single valve box located between each pair of sextants.2

Confined Space

The 2 o'clock yellow valve box is considered a confined space. Any work inside the box must adhere to the confined space regulations described in the BNL SBMS.

1 Vii System Components, RHIC Design Manual, pg29
2 Vii System Components, RHIC Design Manual, pg 33

Trapped Helium Volumes

The potential exists for trapped pockets of high pressure helium inside the valve box. Prior to penetrating the box, contact the cryo- control room at x3837 to verify no trapped helium volumes exist.

Pressurized Helium Sources

2 o'clock Yellow Valve box is part of the RHIC cryogenic system and has the potential to see pressurized Helium gas and Nitrogen gas sources. Following are a list of potential sources and the valves associated with isolating them (Reference drawing(s) 3A995072, 3A995061, 3A995062, 3A995063 and 3A995064.

3A995072 12 o'clock Yellow Ring P&ID

H6059M	
H6060M	
H6061M	
H6062M	
H6065M	**Lead Flow Return to Warm Return Line**
H6066M	
H6067M	
H6068M	
H6069M	
H6078M	**"M" " Line Vacuum Manifold**
H6056M	**"M" " Line Isolation**
H6079M	**"S" Line Vacuum Manifold**
H6055M	**"S" " Line Isolation**
H6080M	**"H" Line Vacuum Manifold**
H6002A	**"H" " Line Isolation**
H6081M	**"U" Line Vacuum Manifold**
H6003A	**"U" " Line Isolation**
H6082M	**"R" Line Vacuum Manifold**
H6004A	**"R" " Line Isolation**
H6017M	**Block and Bleed**
H6022M	**Block and Bleed**

3A995061 SEXTANT 12/1 Sheets 1-8

H7150A	**Flow Manifold @ 1Q3 Yellow**
H7151A	**Flow Manifold @ 1Q6 Yellow**
H7152A	**Flow Manifold @ 1Q9 Yellow**
H7153A	**Flow Manifold @ 1Q11 Yellow**
H7154A	**Flow Manifold @ 1Q14 Yellow**
H7155A	**Flow Manifold @ 1Q16 Yellow**
H7156A	**Flow Manifold @ 1Q19 Yellow**
H7157A	**Flow Manifold @ 1D20 Yellow**
H7158A	**Flow Manifold @ 12Q19 Yellow**
H7159A	**Flow Manifold @ 12Q16Yellow**
H7160A	**Flow Manifold @ 12Q14 Yellow**
H7161A	**Flow Manifold @ 12Q11 Yellow**
H7162A	**Flow Manifold @ 12Q9 Yellow**
H7163A	**Flow Manifold @ 12Q6 Yellow**
H7164A	**Flow Manifold @ 12Q3 Yellow**

3A995062 2o'clock Yellow Ring P&ID

H6280M	
H6281M	
H6282M	
H6283M	
H6284M	
H6285M	**Lead Flow Return to Warm Return Line**
H6286M	
H6287M	
H6288M	
H6289M	
H6266M	**"M" " Line Vacuum Manifold**
H6267M	**"S" Line Vacuum Manifold**
H6268M	**"H" Line Vacuum Manifold**
H6269M	**"U" Line Vacuum Manifold**
H6270M	**"R" Line Vacuum Manifold**
H6212M	**Block and Bleed**
H6217M	**Block and Bleed**
H6260M	**Block and Bleed**
H6222M	**Block and Bleed**
H6256M	**Block and Bleed**
H6275M	**"R" Line Vacuum Manifold**
H6274M	**"U" Line Vacuum Manifold**
H6273M	**"H" Line Vacuum Manifold**
H6272M	**"S" Line Vacuum Manifold**
H6271M	**"M" " Line Vacuum Manifold**

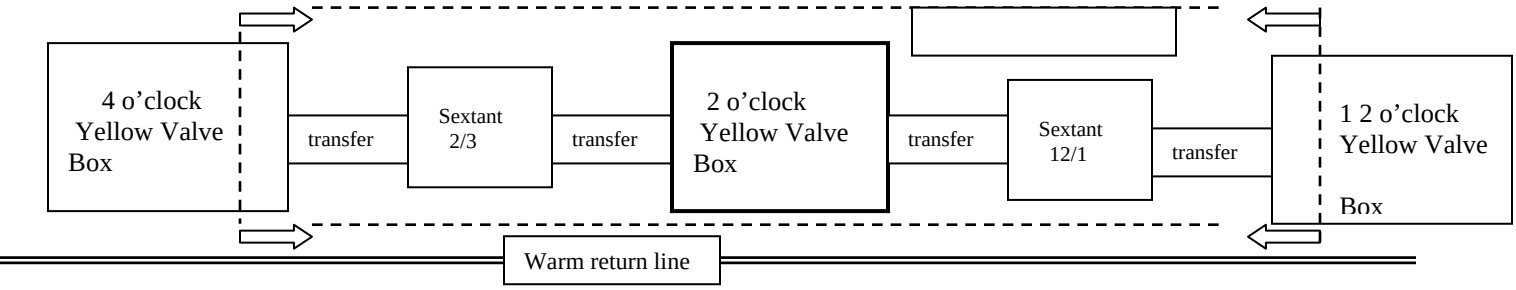
3A995063 SEXTANT 2/3 Sheets 1-8

H6545A	**Flow Manifold @3Q3 Yellow**

H6546A	**Flow Manifold @3Q6 Yellow**
H6547A	**Flow Manifold @ 3Q9 Yellow**
H6548A	**Flow Manifold @ 3Q11 Yellow**
H6549A	**Flow Manifold @ 3Q14 Yellow**
H6550A	**Flow Manifold @ 3Q16 Yellow**
H6551A	**Flow Manifold @ 3Q19 Yellow**
H6552A	**Flow Manifold @ 3D20 Yellow**
H6553A	**Flow Manifold @ 2Q19 Yellow**
H6554A	**Flow Manifold @ 2Q16Yellow**
H6555A	**Flow Manifold @ 2Q14 Yellow**
H6556A	**Flow Manifold @ 2Q11 Yellow**
H6557A	**Flow Manifold @ 2Q9 Yellow**
H6558A	**Flow Manifold @ 2Q6 Yellow**
H6559A	**Flow Manifold @ 2Q3 Yellow**

3A995064 4o'clock Yellow Ring P&ID

H6405M	**"M" Line Isolation**
H6426M	**"S" Line Isolation**
H6402A	**"H" Line Isolation**
H6403A	**"U" Line Isolation**
H6404A	**"R" Line Isolation**
H6480M	**"M" " Line Vacuum Manifold**
H6481M	**"S" Line Vacuum Manifold**
H6482M	**"H" Line Vacuum Manifold**
H6483M	**"U" Line Vacuum Manifold**
H6484M	**"R" Line Vacuum Manifold**
H6422M	**Block and Bleed**
H6409M	**Block and Bleed**
H6424M	**Block and Bleed**



This is a simplified diagram showing all the major cryogenic components of the RHIC yellow ring at the 2:00 position between the 4:00 and 12:00 valve boxes.

1.Vacuum Systems

The only possible operations and environmental issues associated with the vacuum system are locking out the turbo vacuum pumps that are used to establish insulating vacuum. Details are in the electrical safety section. Before entering the valve box contact the C-AD vacuum group for assistance in isolating the vacuum system and introducing Air/Nitrogen into the valve box. The main isolation valve for the valve box is V6202A.

2.Pneumatic Systems

Valves located on the top of the valve box are supplied with compressed air at approximately 100 psig. Air to valves can be isolated via manifolds located at the valve box. Reference drawing 3A995100. Exercise extreme caution when working on top of the valve box, not to damage the plastic tubing that feeds the air to the valves.

3.Tube Trailers

Occasionally helium tube trailers are used to pressurize cryo process lines. These penetrations can be at various locations inside the valve box and may bypass locked out valves. Any person entering the valve box should inspect the area for a tube trailer connection and check with the cryo-control (x3837) room to make sure there are no trailer hazards.

If trailers are stationed at other locations in the Ring, the potential exists for Gas to reach the 2 o'clock yellow valve box via cryogenic process lines (Magnet, Heat shield, Utility, Supply and Return). Check with the cryogenic control room to determine if trailers are stationed at other locations in the ring and to insure local LOTO is in place in the area where the trailer connects to the cryo system The LOTO list should be covered in the job specific work permit.

Piping arrangement.

External

Extreme caution should be exercised when working on or around the valve box, a review of the work plan should be done prior to working on the valve box.

There are numerous hazardous conditions associated with the piping arrangement. For example low hanging piping can cause head injuries. Also work that is outside of the "railed" platform shall not be attempted by "climbing" over the rail.

Internal

A detailed plan should be in place before working inside the valve box, the following is a list of hazards inside the valve box.

- The valve box is shaped like a cylindrical tank with no floor built into it, this makes it difficult to move around.
- The piping arrangement is close together and is covered in MLI.
- Care should be taken not to damage small instrument tubing.
- Sharp edges from brackets are a hazard.
- If there is any welding and cutting involved in working inside the valve box a CONFINE SPACE PERMIT is required.

Figures 1-3 below are some of the external views of the 2 o'clock Yellow Valve Box.

Fig. 1 View on top of the 2o'clock valve box, showing valve actuators, electric cables and pneumatic tubing.

Also notice the structural steel supporting the VJR Piping. Extreme caution is advised when working around the valve box.

Fig.2 A view of the man-hole cover of the valve box, Notice that it is located in a "pit". Also a CONFINE SPACE sign is attached.

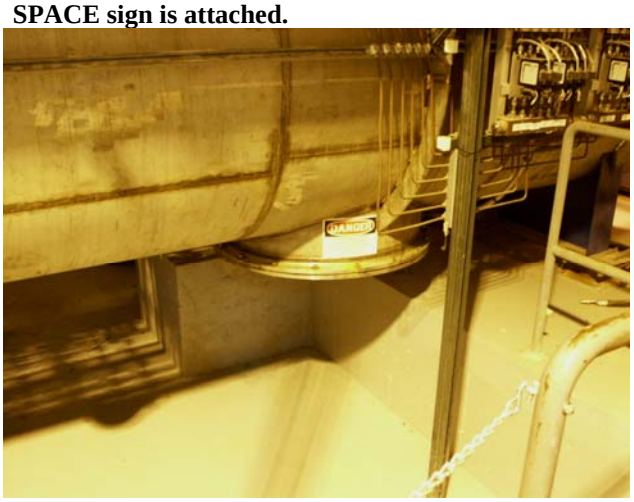


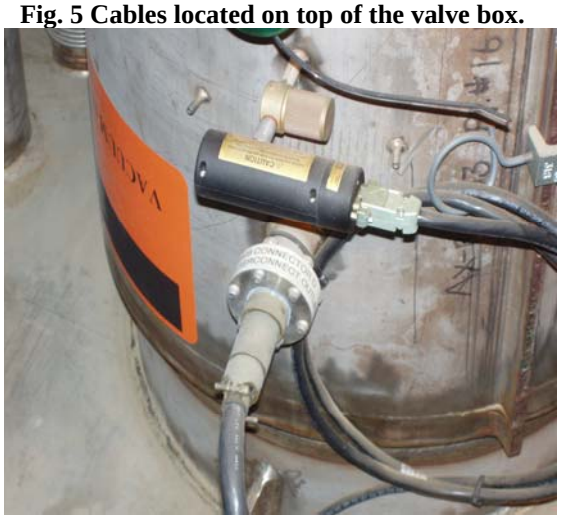
Fig.3 Posted at the entrance of each valve box building is a caution sign stating the ODH hazard level. Contact information card

Electrical Safety Issues

1) In conjunction with the accident in Cold-box 3 (RHIC 25 Kw refrigerator) in which a technician burned his hand on a heater, we investigated the potential for a similar event in the yellow valve box in service building 4. Careful inspection of the valve box indicates no lethal voltage potentials and no installed heaters internal to the valve box. There are no feed- through(s) externally that contain high voltages that would pass into the cold-box. The only feed-through(s) (cables labeled 2YA, 2YB and 2YC) that exist are for low-level instrumentation (temperature sensors).

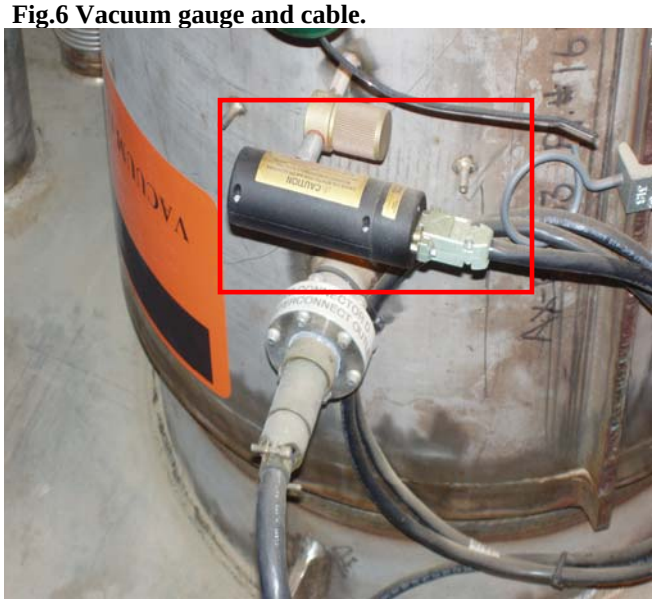
Fig.4 Cables for low – level voltage instrumentation. The location of the cables are on the bottom of the valve box.

Fig. 5 Cables located on top of the valve box.



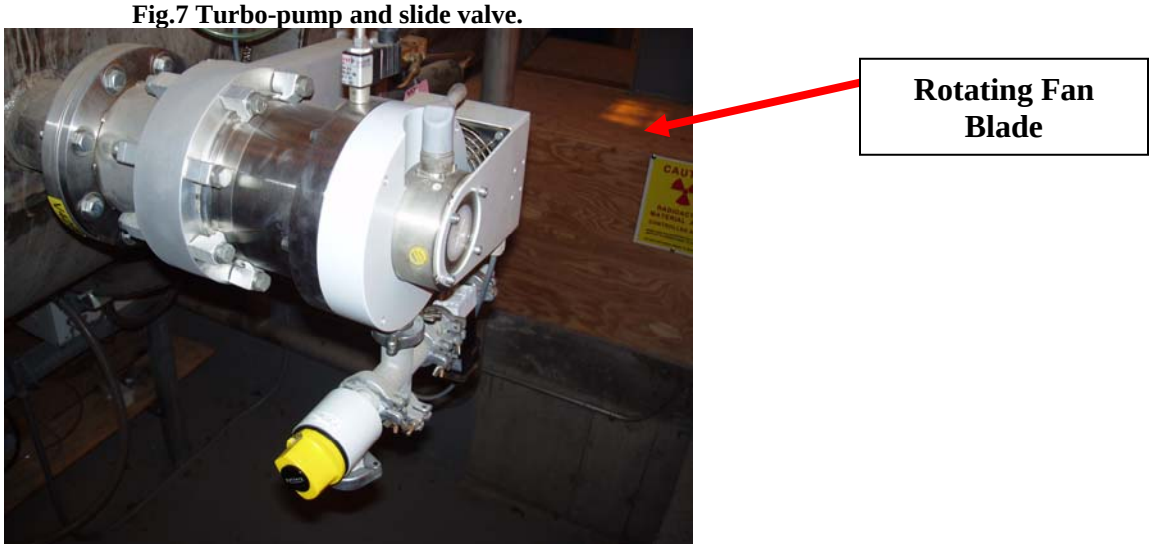
2) Gauges and controllers for insulating vacuum are located at various locations on the valve box. They are all external of the valve box and do not enter the valve box with any high voltage.

Fig.6 Vacuum gauge and cable.



3) Each valve box has an associated slide valve as shown in the photo below. There is 120 Volts ac present at this slide valve. A fan is also present so caution should be taken due to the rotating blade.

Fig.7 Turbo-pump and slide valve.



Supporting Documents:

3A995072 12o'clock Yellow Ring P&ID
3A995061 SEXTANT (yellow) 12/1 Sheets 1-8
3A995062 2o'clock Yellow Ring P&ID
3A995063 SEXTANT (yellow) 2/3 Sheets 1-8
3A995064 4o'clock Yellow Ring P&ID